ML experiment tracking with VScode, Git and DVC
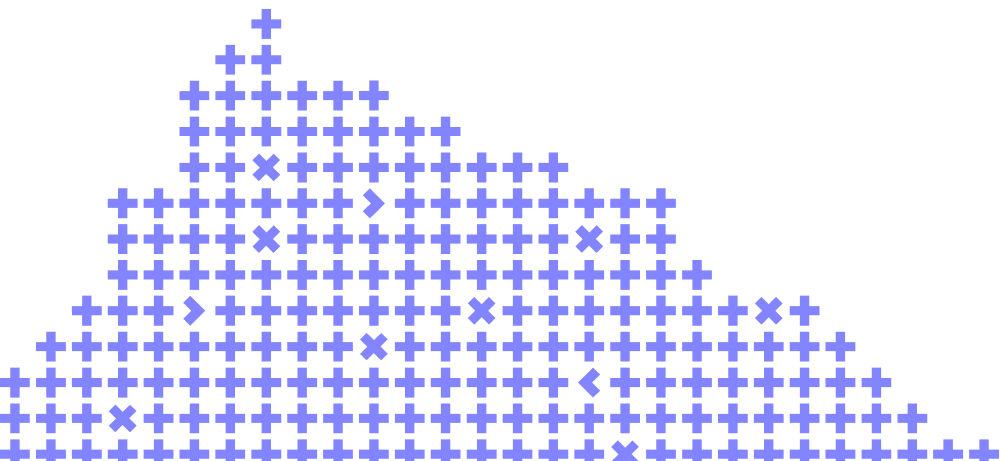
Dmitry Petrov

About me

Dmitry Petrov
@FullStackML

Before

Ex-Data Scientist at Microsoft

Now

Creator of **D**ata **V**ersion **C**ontrol

Co-founder, CEO at Iterative.ai
(San Francisco, CA)

You will learn…

1. The importance of **experiment tracking**
2.
3.

You will learn...

1. The importance of **experiment tracking**
2. How to leverage the tools in ML you are already using: **VScode, Git**
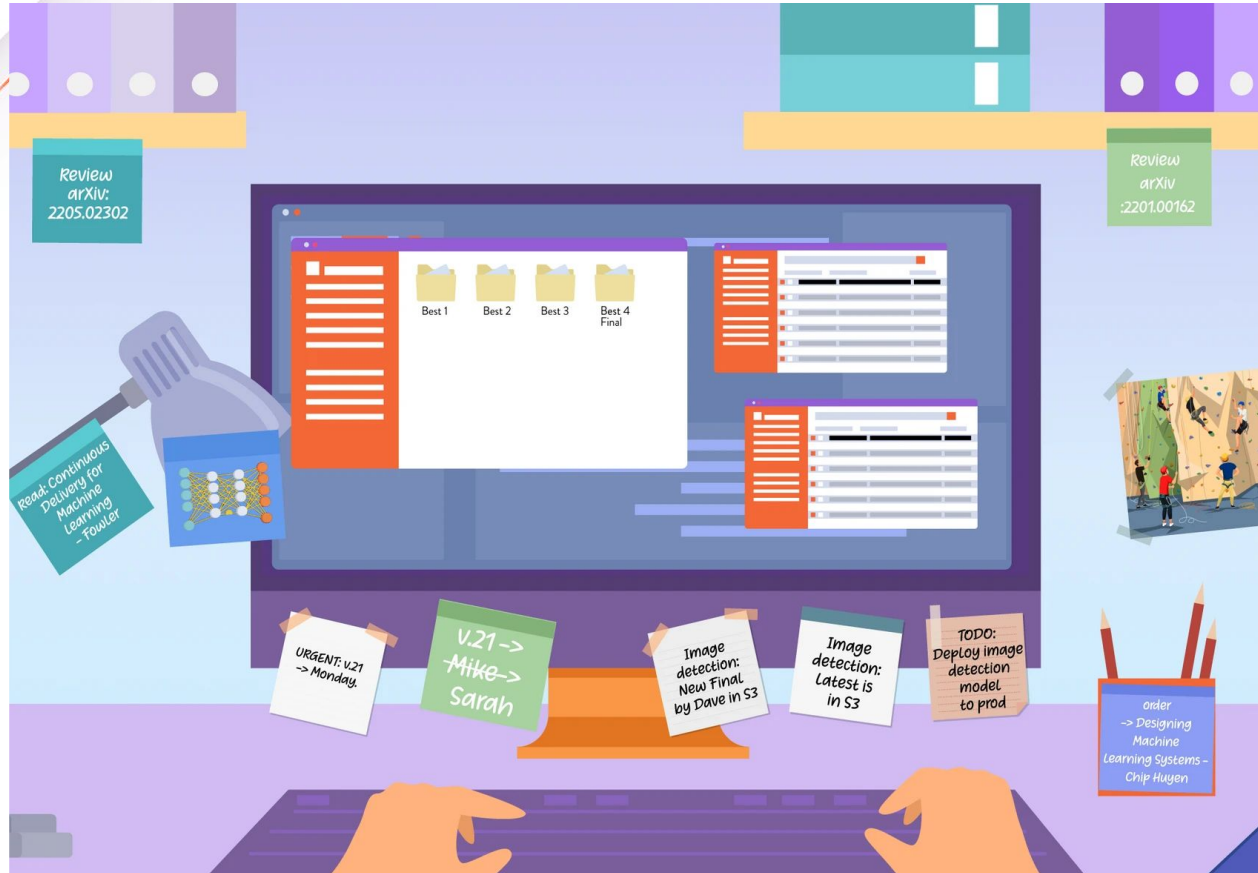3.

You will learn...

1. The importance of **experiment tracking**
2. How to leverage the tools in ML you are already using: **VScode, Git**
3. Easy set up of GPU resources - **Codespaces**

I. ML experiments tracking

👩‍🔬

The struggle is real...

Why do we track ML experiments?

1. **Log.** Data, metrics, hyper-parameters, code.

2. **Organize.** Centralized place to store.

3. **Reproduce.** Save experiments & recover for future self and team.

History of ML Experiment Tracking Tool

Sacred

2014   2018   2022

How it looks like (Sacred example 1)

Id	Optimizer Name	Batch Norm	Lr	Epochs Per Lr	Batch Size	Val accuracy (patch)	Val accuracy (image)	Val loss
166	SGD	true	0.003	8	8	0.866718106995	0.919821673525	0.4269460
163	SGD	true	0.003	8	12	0.988106060606	0.999393939393	0.0514828
157	SGD	true	0.003	8	12	0.988989898989	0.998383838383	0.0459522

How it looks like (Sacred example 2)

Id	Experiment name	Command	Start time	Last activity
+	39	■ MNIST with TF 1.8.0	main	01:45:25 PM 05/01/2018	01:47:06 PM 05/01/2018
-	34	■ German nouns	runExperiment	07:06:41 PM 05/06/2017	07:14:30 PM 05/06/2017

Details for: German nouns (id: 34)

Config

Run info

Captured output

Result

Experiment

Meta Info

Host Info

Tensorflow logs

Metrics plots

Metrics

☐ Display all

☑ validation.accuracy

☑ training.accuracy

☐ validation.cost

☐ training.cost
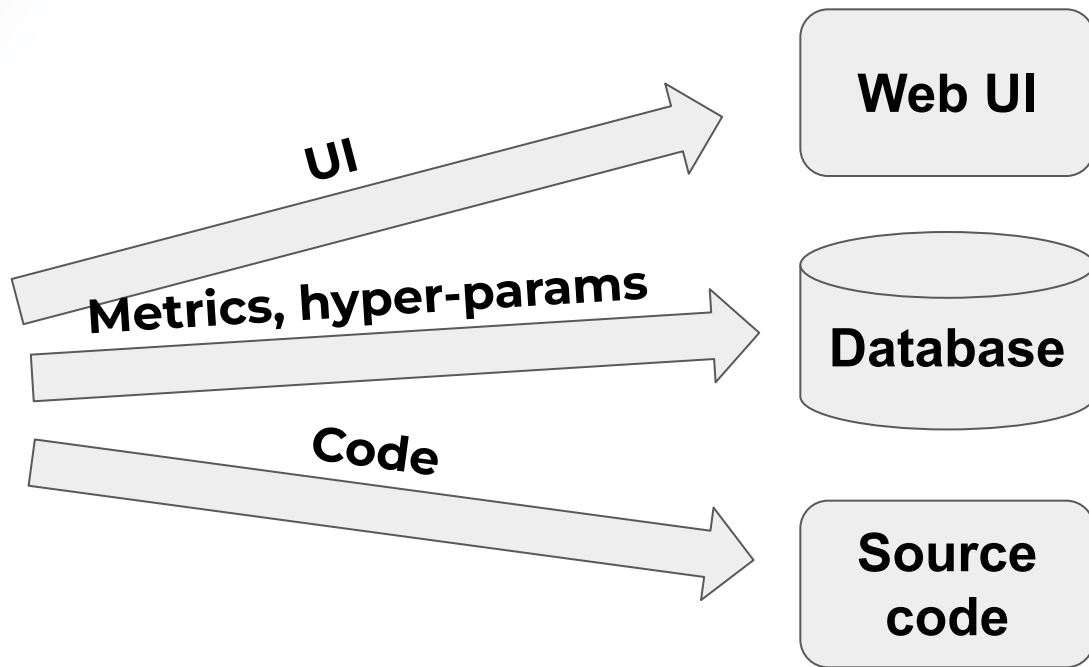
x-axis type

⦿ steps

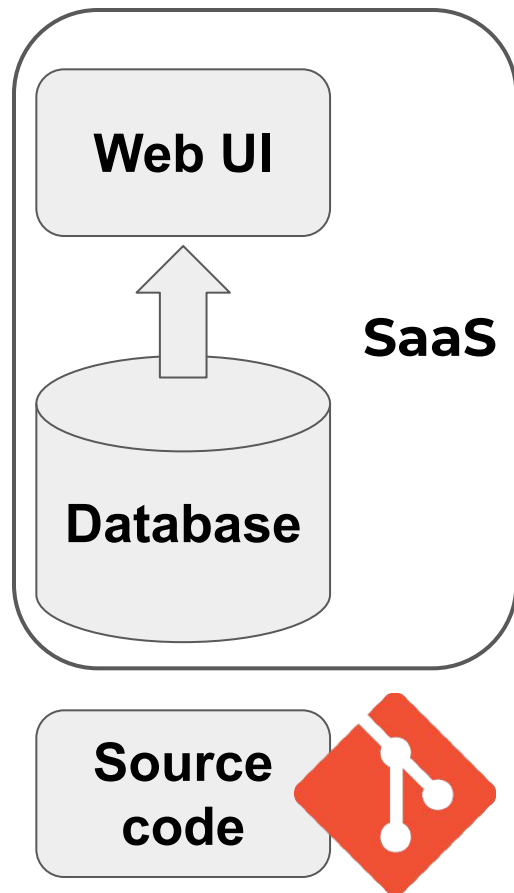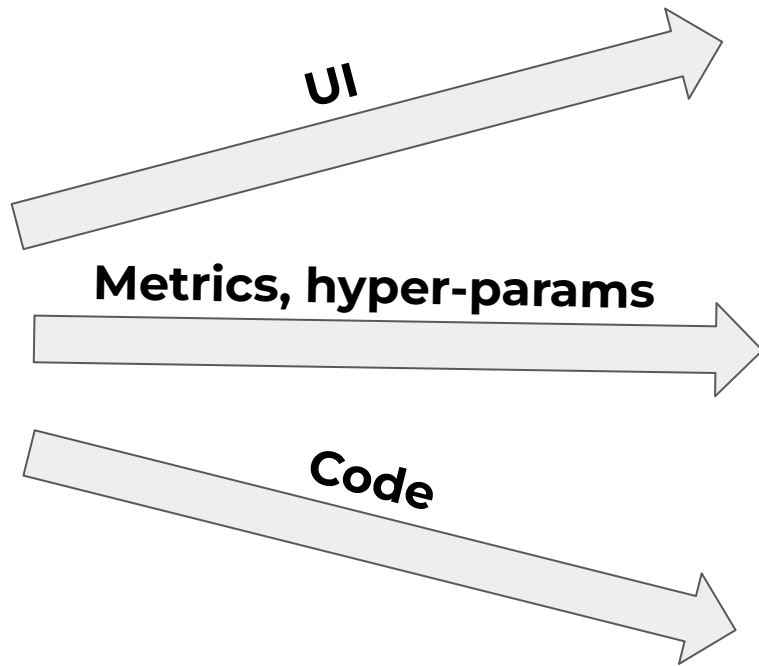○ time

y-axis type

⦿ linear
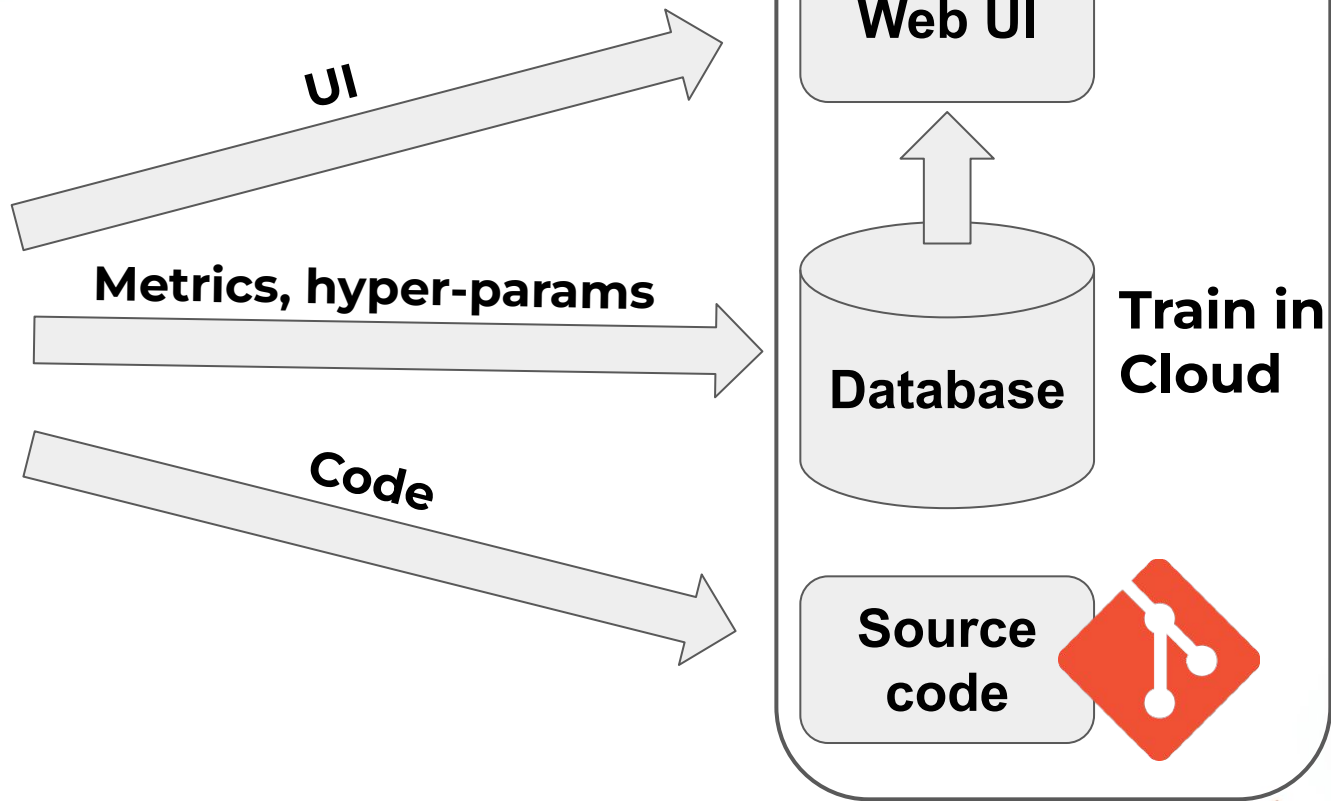
○ logarithmic
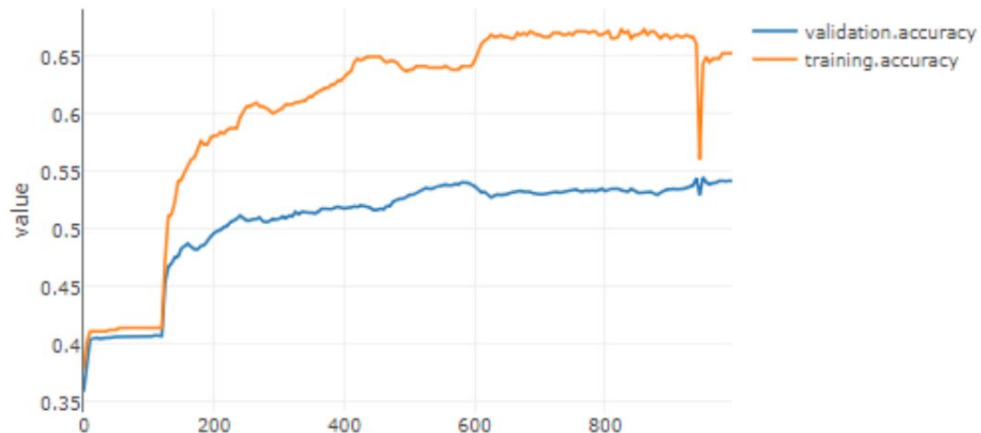
History of ML Experiment Tracking Tool (2)

Tensorboard

Comet.ml

Neptune AI

Sacred

MLFlow

ZenML

Weights&Biases

2014

2018

2022

Exp tracking architecture

UI → **Web UI**

Metrics, hyper-params → **Database**

Code → **Source code**

Exp tracking architecture: SaaS

UI

Metrics, hyper-params

Code

Web UI

SaaS

Database

Source code

Exp tracking architecture: cloud

UI

Metrics, hyper-params

Code

Web UI

Database

Train in Cloud

Source code

Can we do better?

UI

Metrics, hyper-params

Code

Web UI

Database

Train in Cloud

Source code

Exp tracking architecture

UI

Metrics, hyper-params

Code

Web UI

Database

Source code
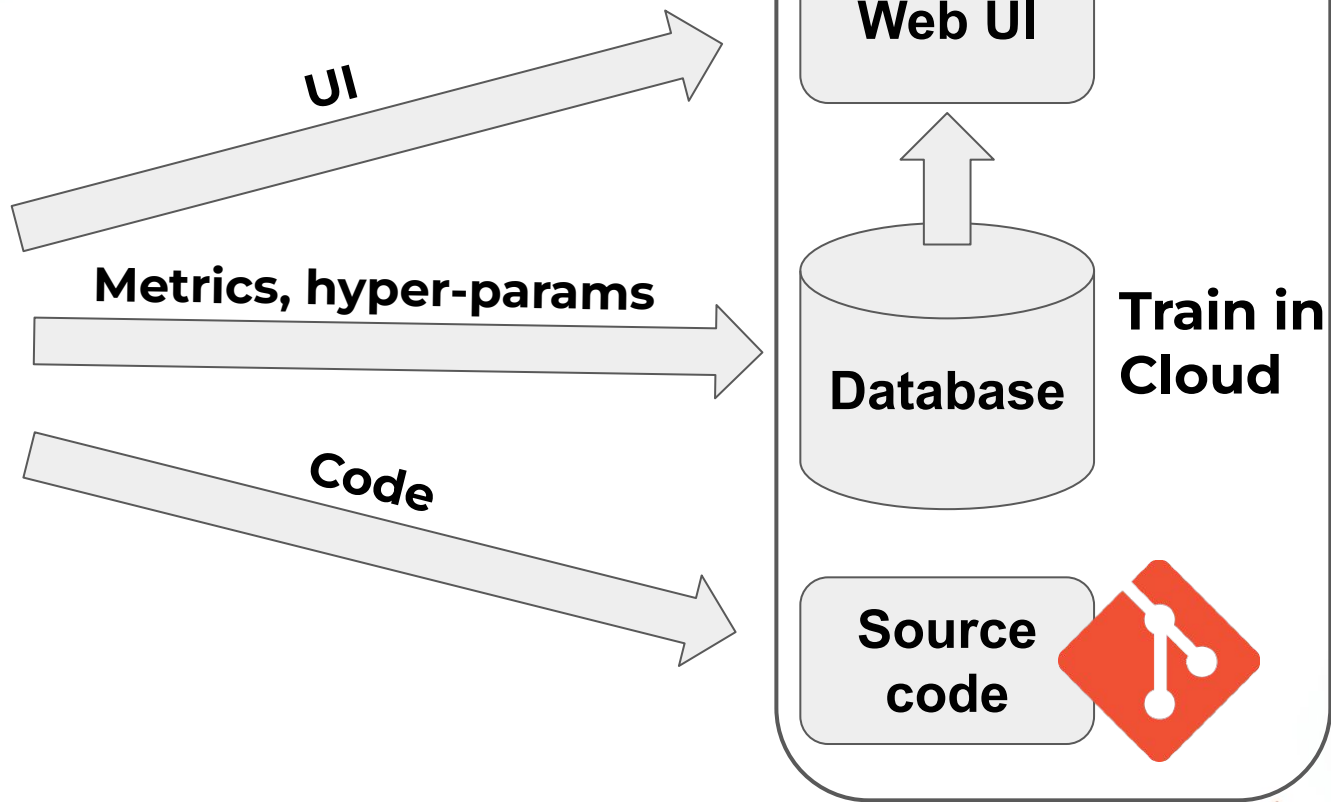
Codespaces

Exp tracking architecture
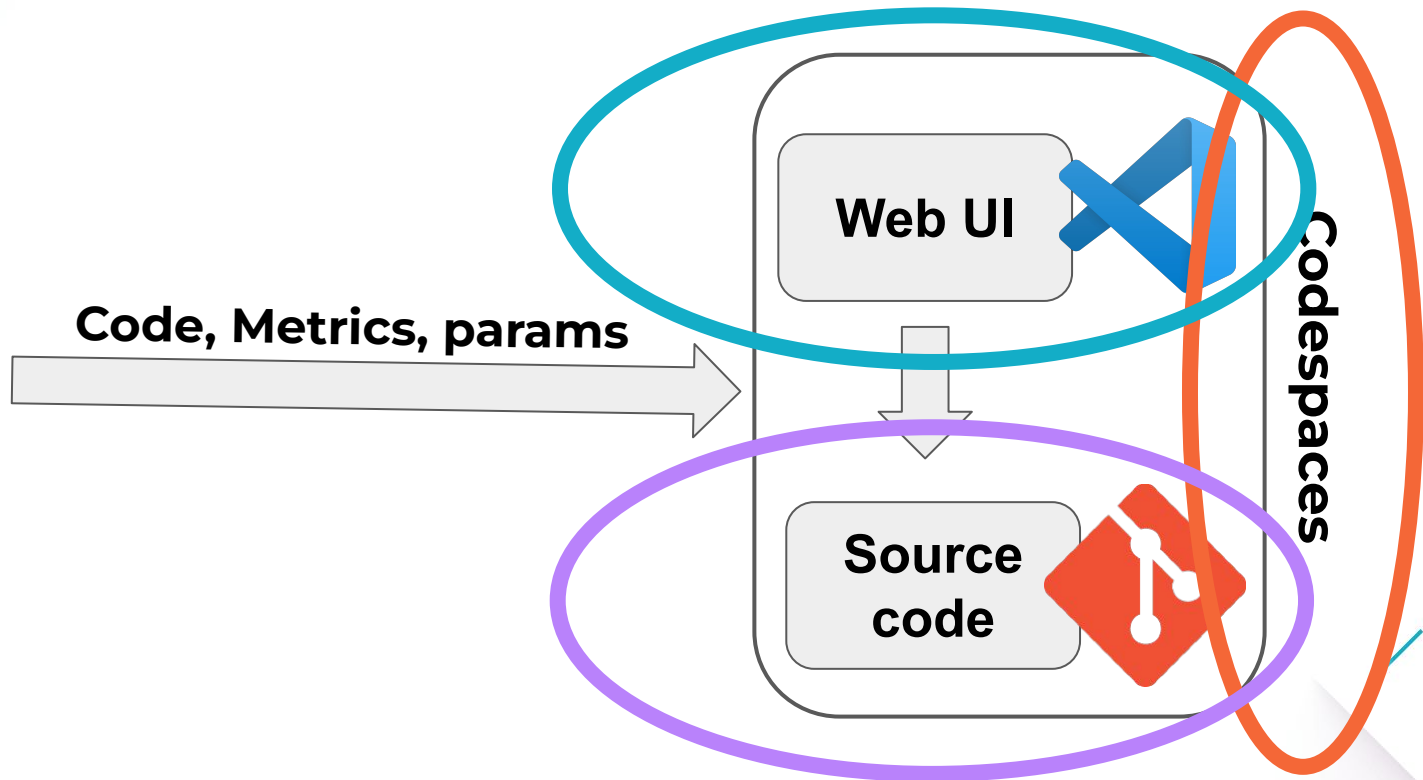
Code, Metrics, params

Web UI

Source code
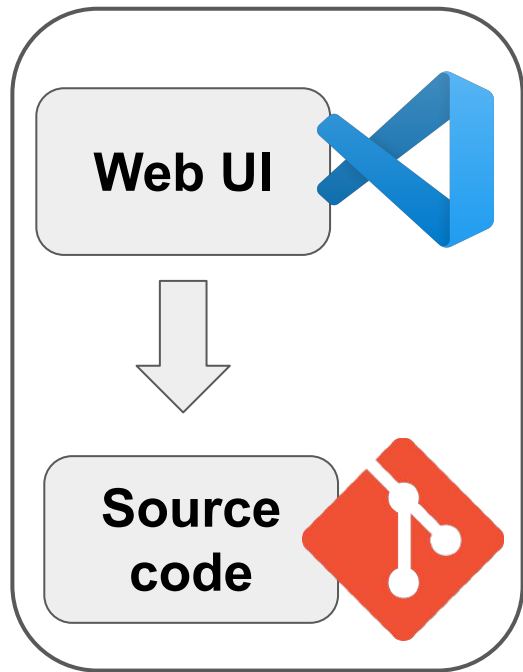
Codespaces

Exp tracking architecture
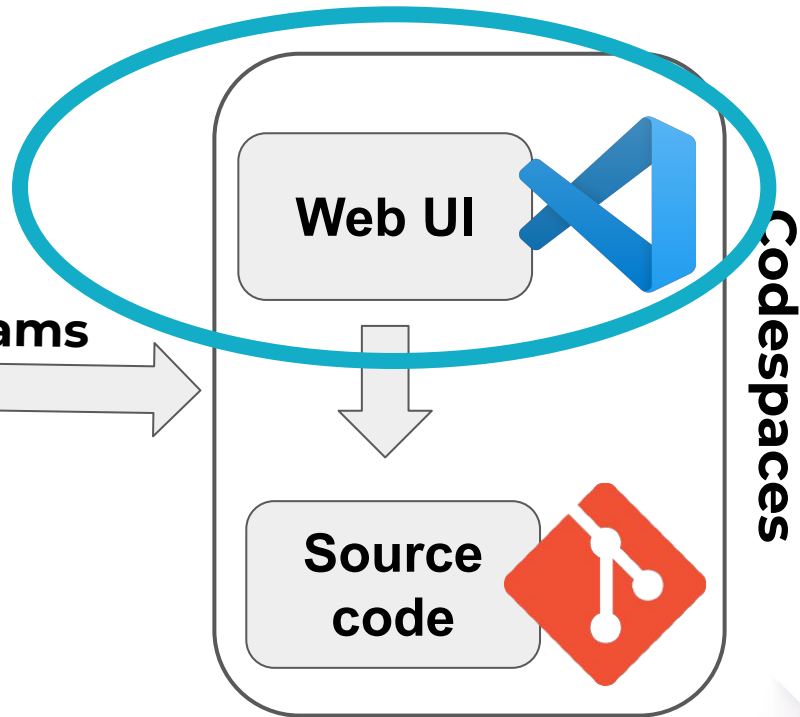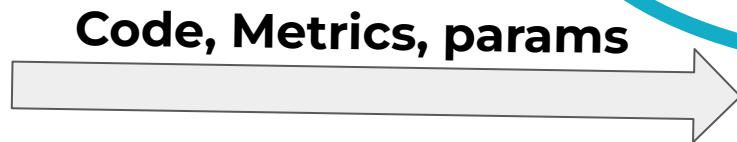
Benefits of Git for experiments

1. Reduce the number of moving parts in ML infrastructure

2. Git becomes the single source of truth for ML experiments

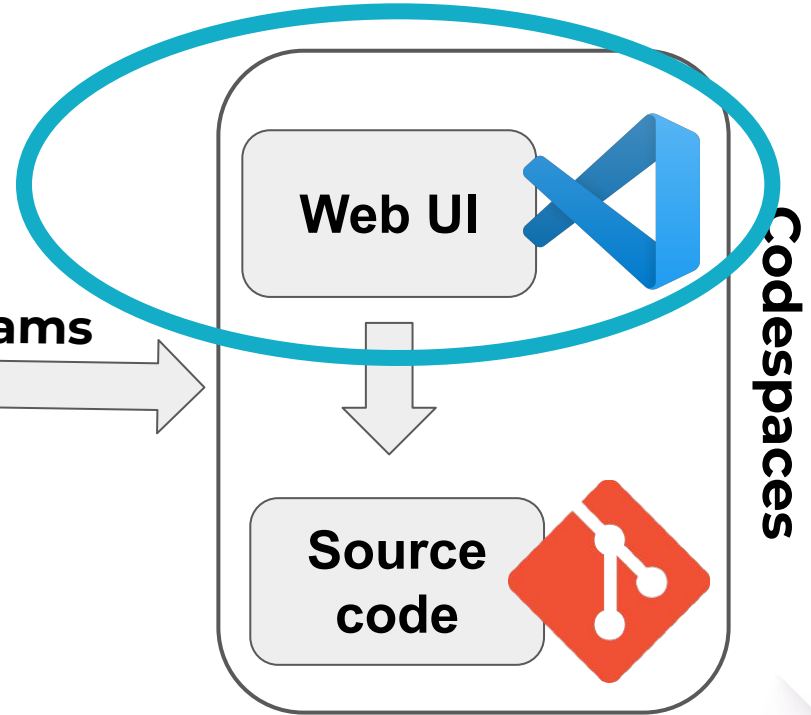# II. VScode for experiment tracking
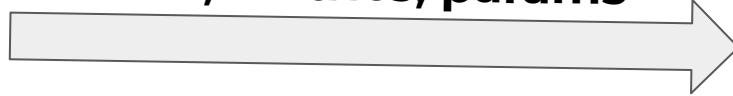
Simplified architecture

Code, Metrics, params

Web UI

Source code

Codespaces

Demo - VScode

Simplified architecture

Code, Metrics, params

Web UI

Source code

Codespaces

- **Right in your IDE**

- **Serverless**

III. Experiments tracking with Git

Demo - ML with Git

Code, Metrics, params

Web UI

Source code
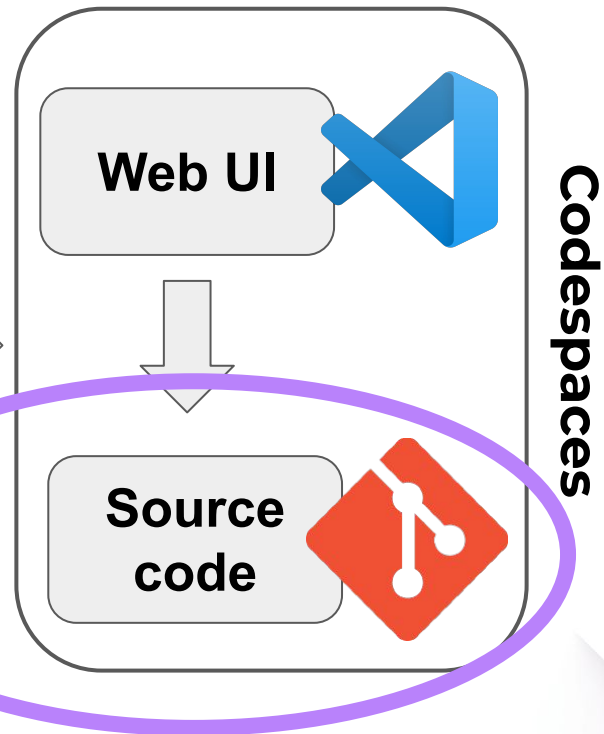
Codespaces

Demo - ML with Git

Demo - ML with Git

Code, Metrics, params

Web UI

Source code
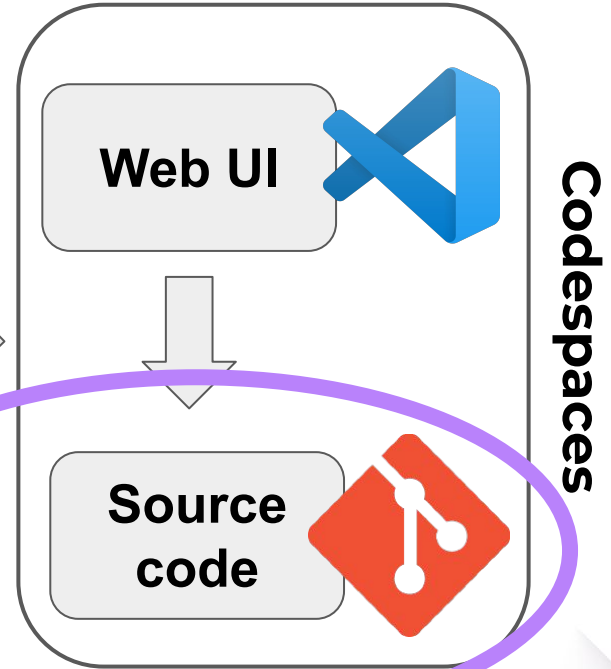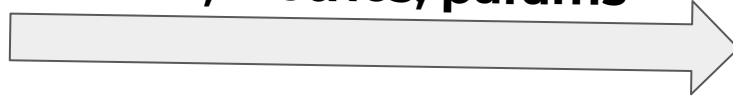
Codespaces

- **Git as the source of truth**
- **Collaboration in GitHub**

IV. Codespaces for training ML models

Demo - ML with Git

👩‍🔬 → **Code, Metrics, params** →

Web UI

Source code

Codespaces
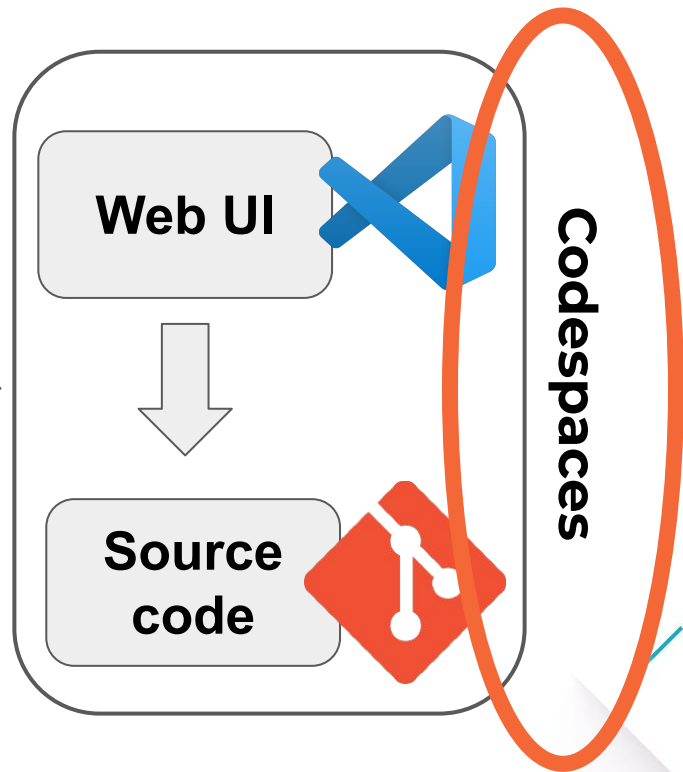
Conclusion

Git ecosystem simplifies MLOps:

1.

2.

3.

Conclusion

Git ecosystem simplifies MLOps:

1. **ML engineer.** Use Git that you already know.
2.
3.

Conclusion

Git ecosystem simplifies MLOps:

1. **ML engineer.** Use Git that you already know.
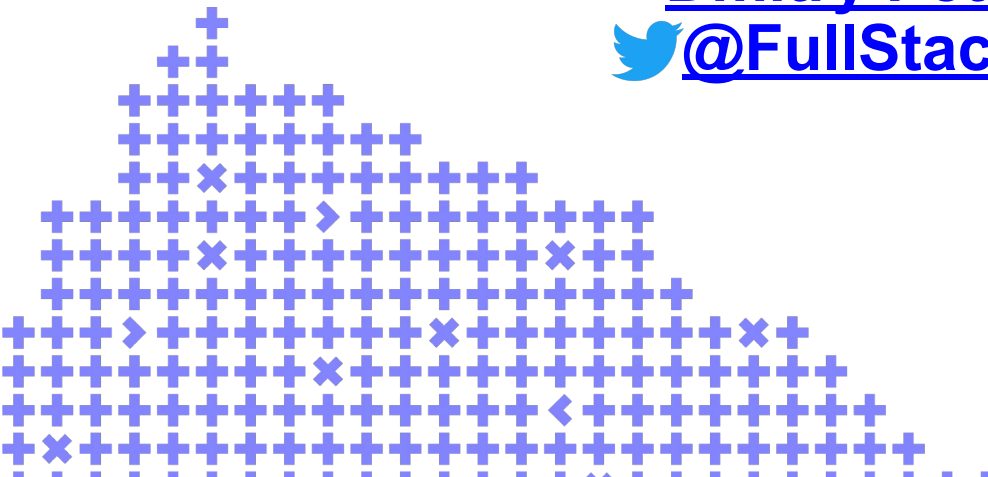2. **Teams.** Break the wall between ML and Eng teams.
3.

Conclusion

Git ecosystem simplifies MLOps:

1. **ML engineer.** Use Git that you already know.
2. **Teams.** Break the wall between ML and Eng teams.
3. **Business.** Maximize value from your investments in Git tools.

Leave your feedback!

You can rate the talk and give a feedback on what you've liked or what could be improved

Dmitry Petrov
@FullStackML

iterative.ai

High Load Armenia

Co-organizer
Yandex